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A tale of two levels

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Appendix C: English summary

Man is a social animal. This social aspect of our being is, among others, visible in our cooperative behaviour towards other persons. One form of cooperative behaviour is working together in groups to achieve a certain objective. During the course of human history, working in groups has proven to be a constant factor in our society; it can be said that our society is founded on cooperation. A group of people wanting to achieve something together, has the possibility of division of labour to improve efficiency. Thus, it will come as no surprise that with the rise of industrial production organisations in the 18th and 19th century, formal cooperation structures were created: teams in organisations. As it turned out, especially in organisations the division of labour and tasks was a sound way to improve effectiveness and productivity. More and more organisations did build their organisational structure using teams as the building blocks, a development which continues until this day. Parallel to this development is the interest that began to arise from the social sciences with regard to the functioning of people in groups, and organisational teams in particular. Specific fields of research within the social sciences that focus on this are social- and organisational psychology. Central question within those disciplines with regard to organisational teams is how the functioning of these teams and their members is determined by the interactions between the teammembers en individual behavior within the team. Two aspects of organisational teams have received detailed attention; the performance of teams and individuals, and the processes that occur within teams. A model that is often used in this type of organisational research is McGrath's input-proces-output model. This model also forms the basis of the conceptual model that has been used in this thesis. Core concept of this model is that both individual and team performance are determined by the quality, strength and direction of the group processes. Here, Steiner's "formula" 'Actual performance = Potential performance - proces losses' give an indication of the relation between group processes and performance. 'Proces losses' can also be replaced by 'process gains', as group processes can also have a positive impact on team performance. How these group processes within teams come about and occur, depends on the input. This input can consist of a large variety of factors, which can be classed as one of three categories. First, there's the building blocks of teams, the individuals with their specific characteristics. What the individual team members bring with them in terms of characteristics, will to a large extent determine how the interactions between the teammembers and the group processes will develop. These individual characteristics consist of knowledge, skills and abilities (KSA's), personality traits and demographic characteristics. As a second input category, there's the generic team characteristics that influence the groupprocesses, such as the structure of the team, role distribution, leadership and the task the team works on. And finally, the third input category is defined by the environmental aspects of

teams, such as characteristics of the organisation, organisational culture and reward structure.

All these different input factors exert their influence on the development of the group processes, and together determine team and individual performance. The main aspect of the conceptual model that is used in this thesis is that the input factors are not examined separately. Instead, it is examined how the interaction between the input factors influences the group processes and performance. As this is an empirical study, the number of input factors is limited to two. This allows for an in depth exploration on how the interaction between these two input factors shape the group processes. Another aspect of the conceptual model used in this thesis that differs from the original input-process-output model, is that not only output but the group processes as well are considered performance. This only leaves the relationship input-output in the conceptual model. The focus of the model is on the interactive relation between the input factors, group processes and performance. The performance that has been examined is divided into two levels. Firstly, there is team performance, which is the actual job the team is meant to accomplish, and secondly, there is individual performance. The dependent variables that indicate individual performance as used in this study, are team viability and job satisfaction. The other output factor, group processes, is also divided into a number of dependent variables. First of these is intrateam cohesion, a measure of the strength of within team coherence. The second group process variable is intrateam cooperation, a measure of how well the team works together on a task. Third indicator of the group processes is how often there are conflicts and disagreements within the team, and what the intensity of these conflicts are. Two types of conflict are measured, ie. task-related conflicts and socio-emotional conflicts. And as a last dependent variable of group processes measured the level and content of intrateam and inter-individual communication was included. In this study, these four variables represent the group processes, and serve as dependent variables so that they are part of the output of teams.

The two input factors that have been used in this study are the teamtask characteristics and the personality traits of the individual teammembers. As the task the team works on often determines the structure of the team and the necessity for intrateam and interindividual interaction, that teamtask characteristics are input variables that should not be excluded from the input-process-output model. The specific form of the in the model suggested interaction between personality and the team task is that of a moderator. Here, the teamtask characteristics influence the relation between team personality composition and group processes/team performance. In this study, three teamtask characteristics were included; interdependence, routineness and autonomy. Task interdependence is an indicator for the level of mutual interdependence the team members have when working on the task or a part of the task. Task interdependence makes demands on the ability to be able to work together in a team. Task routineness indicates the ambiguity and

repetitiveness of the task the team works on. A routine-like task will not contain any surprises, while a non-routine task may change in nature or content and brings about uncertainty with regard to the task.. Non-routineness makes demands on the capability to adapt, both on a team and individual level. And as a last team task characteristics task autonomy was included. Task autonomy indicates the level of freedom a team has in executing the task. Task autonomy is mainly related to self-directed teams, which have a larger extent of freedom than traditional teams have. It requires personal abilities to be able to handle this freedom in a responsible and constructive way.

Apart from the team task characteristics, the personality characteristics of the team members have been included in the conceptual model as input variables. In this study the Five Factor Personality Inventory (FFPI) has been used as a personality typology. The five factors that make up this typology are extraversion, agreeableness, conscientiousness, emotional stability and intellectual autonomy. The level of extraversion of an individual indicates how sociable, open, assertive and gregarious a person is, while agreeableness indicates how cooperative, friendly and considerate a person is. Conscientiousness indicates to which extent an individual is responsible, reliable and persistent. Emotional stability is an indicator of how worrisome, neurotic and insecure a person is. And as a last personality characteristic, intellectual autonomy is a measure of how curious, imaginative and broadminded a person is. These five personality traits form the primary input variables, which together and in interaction with the team task characteristics shape the group processes and ultimately team performance. Based on the theory and the conceptual model, a number of hypotheses have been derived which have been empirically tested. Of extraversion and agreeableness it was expected that a higher mean within the team has a positive effect on performance, an effect that is strengthened by the level of the team task characteristics. On the other hand, higher variance of extraversion and agreeableness within teams were suggested to have a negative influence on performance. It was also expected that a better fit between team task and personality is beneficial for individual outcomes. Of conscientiousness it was again expected that a higher within team mean would have a positive relationship with team performance, an effect that will be enhanced by the level of task autonomy. A higher variance of conscientiousness within teams has a negative impact on team performance, an effect that is strengthened by the level of team task autonomy. When it comes to working in teams, emotional stability as well is suggested to be a positive personality characteristic; the higher the mean, the better team performance will be. This is not so for the variance of emotional stability in teams. Here, it was expected that homogeneous teams perform better than heterogeneous teams. The level of team task non-routineness will enhance both effects. For intellectual autonomy, a different theoretical approach was used. Expected was that the effect of the mean of intellectual autonomy within teams depends on the level of team task non-routineness. A positive effect was expected

when teamtask non-routineness is high, and a negative effect was expected when teamtask non-routineness is low. In contrast, a higher variance of intellectual autonomy was expected to be unilaterally negative, regardless of the level of teamtask non-routineness.

As the subject of this study is organisational teams, the research has been done within a number of organisations. Within these organisations the data has been collected from all the teams that were active in these organisations. On the basis of this data the analyses have been executed and the hypotheses tested. The data have been collected using questionnaires, which were completed by the team members. The dataset consists of 87 teams and 424 individuals. Where necessary, the individual scores have been aggregated to the team level, to determine team characteristics such as team personality composition. By calculating the intraclass correlation of a team characteristic, the reliability of aggregating the individual scores to a team characteristic was checked. This means that the data was collected on two levels (i.e. there was a nested structure), individual level and team level. This is a characteristic of team research that is also represented in the conceptual model, the theory and the hypotheses. Relationships between independent and dependent variables on the team level were suggested, which are the main interest of this study. In addition, relationships between independent and dependent variables on the individual level were suggested, as well as relationships between independent variables on the team level and dependent variables on the individual level. These last two types of relationships require a different analytical technique, the multilevel model analysis. Within the conceptual model two specific models have been tested, the macro-level model and the multilevel model. Aggregating was done by calculating the mean score of a team. Exceptions to this were the team scores for team personality composition. The team personality composition was determined by calculating the mean score of a team, as well as the variance of the individual scores and the minimum and maximum scores within a team.

The analyses of the macro-level model show that with regard to extraversion, the maximum score of extraversion within teams and the mean of extraversion within teams are the aggregation methods that have the most predictive value when examining team performance. The higher the highest score of individual extraversion within teams, the better team performance will be. The theoretical explanation for this is the effect of a formal or informal socio-emotional team leader. In addition, the effect of the mean extraversion within teams depends on the level of teamtask autonomy. When there is a high level of teamtask autonomy a higher mean of extraversion is detrimental for team performance, while for a low level of teamtask autonomy a higher mean of extraversion within teams is beneficial for team performance. A possible explanation for this is the occurrence of dominance struggles within the team when teamtask autonomy is high.

When it comes to agreeableness, it appears that the quality of the group processes and team performance depend on the mean of agreeableness within teams; more is better. The same goes for the minimum score of agreeableness within teams, an effect that for intrateam conflict is enhanced by the level of teamtask interdependence. Also, it was found that the positive effect of the maximum score of agreeableness within teams is strengthened by the level of teamtask interdependence within teams.

Discordant note in these results is the lack of a clear effect of conscientiousness. Only the maximum score of conscientiousness within teams has a positive effect on team performance. This effect is suggested to be caused by the presence of a formal or informal task-directed team leader. Apart from this, there is an indirect effect for the variance of conscientiousness within teams on intrateam cooperation. When there is a high level of teamtask autonomy, it appears that a higher variance of conscientiousness within teams has a negative effect on the occurrence of cooperation within teams. This may possibly be a result of feelings of unfairness within the team members who have a higher score on conscientiousness.

More direct results have been found for the various aggregation methods of emotional stability. Both the value of the minimum score and the maximum score of emotional stability within teams have a positive effect on the quality of the group processes and team performance. The same goes for the mean of emotional stability within teams; more is better. The task the team works on has an additional influence on the relationship between the value of the maximum score of emotional stability within teams and the occurrence of intrateam conflict. The level of teamtask non-routineness enhances the restraining effect the maximum score of emotional stability has on the occurrence of intrateam conflict.

With regard to the last personality characteristic included in this study, intellectual autonomy, the results show that there are no direct effects for intellectual autonomy on the group processes and team performance. However, the teamtask operates as a moderating variable. When teamtask non-routineness is low, a higher variance of intellectual autonomy has a negative effect on the occurrence of intrateam cooperation and team performance. In contrast, when teamtask non-routineness is high, a higher variance of intellectual autonomy has a positive effect on cooperation and team performance. Suggested reason for this is a compensation-effect, for which the more capable team members support other team members or take over some of their workload. Apart from this effect, the teamtask non-routineness also has a moderating influence on the relationship between the minimum score of intellectual autonomy within teams and the occurrence of intrateam cooperation. This relationship is of a positive nature when the level of teamtask non-routineness is low, while the relation is found to be negative when the level of teamtask non-routineness is high. This effect is also thought to be caused by a compensation-effect. Overall, it appears the task

characteristics of the task a team works on do matter, when the relationship between team personality composition and group processes/team performance is examined. This relationship is of a stronger nature when the teamtask contains a higher level of task interdependence, task autonomy and/or non-routineness.

Next step in the analysis of the data was testing the multilevel model. With this model it was examined what the impact was of the individual and team-level input variables on the dependent variables team viability and job satisfaction. What was noteworthy was that is were mainly individual personality characteristics that contributed to explaining differences between team viability and job satisfaction among team members. The higher the individual score on a personality trait, the higher both team viability and job satisfaction were. With regard to extraversion, this effect was enhanced by the level of teamtask interdependence. The results also showed that the effect of the mean of extraversion within teams on job satisfaction depends on the level of teamtask autonomy. At lower levels of teamtask autonomy this effect is positive, while at higher levels of teamtask autonomy this effect is negative. This may again be the result of dominance struggles within a team. A striking result for agreeableness was that the effect of the level of variance of agreeableness within teams on job satisfaction depends on the level of teamtask interdependence. This effect is positive at higher levels of teamtask interdependence, but negative at lower levels of teamtask interdependence. When teamtask interdependence is high agreeableness does not conform to the theoretical expectation. For conscientiousness, there was only found a positive effect for the individual score of conscientiousness. Just as with the macro level model, no additional effects were found for conscientiousness when applying the multilevel model. Contrary to expectations, conscientiousness as a personality characteristic does not appear to have any added value when predicting team and individual performance. When it comes to emotional stability, this personality characteristic does have added value when trying to understand differences in job satisfaction. The level of variance of emotional stability within team does not matter that much for job satisfaction when teamtask non-routineness is high. However, there is a negative relationship found between the level of variance of emotional stability within teams and job satisfaction when the level of teamtask non-routineness is low. Based on the theory it was suggested that homogeneous teams are to be preferred above heterogeneous teams. It may be that this negative relationship will be compensated by team members who support each other when teamtask non-routineness is higher. Another effect that was found for emotional stability was that the maximum score of emotional stability within teams has a positive relationship with job satisfaction, but only when teamtask non-routineness is low. This may be the effect of a formal or informal task team leader. The results found for the last personality characteristic, intellectual autonomy, indicate that a higher variance of intellectual autonomy within teams has a negative effect on job satisfaction. In addition, the various analyses of the multilevel model show that the

minimum and maximum score of personality characteristics within teams hardly matter as predictors for team viability and job satisfaction.

This thesis is concluded with a chapter in which reflections are given on the theory, the model, the research method, analytical methods and the results. The limitations of the conceptual model and possible alternative contents for the model were described by using contextual influences and other fitting input factors. The objective of this thesis was to capture in a specific model the core of working in teams, i.e. the interplay between different team members and the interaction between composition variables and task characteristics of a team. As it turned out, a number of the hypotheses were not supported by the data, while some of the unexpected results found indicated a need to adapt the theoretical foundations of the model. An example of such an adaptation is the compensation effect described earlier. Follow up research might examine how specific elements of the model influence each other. The message is that input factors should not only be examined separately, but that the interaction between input factors needs to be examined as well. Pivotal point here is the task the team works on and the characteristics of this task. In addition, the setting of the research as well as the method of collecting and analysing data can differ from one study to the next, ranging from lab studies to field studies and from qualitative to quantitative team research. What matters is that when new organisational teams are formed and existing organisational teams are changed, the task is essential for understanding the relationship between team personality composition and group processes/team performance. The use of a multilevel approach should not be excluded in this process.